Differential Cold Survival of Two Sibling Species of Blow Flies, *Phaenicia sericata* and *Phaenicia pallescens*

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Abstract: The overwintering capabilities of sibling calliphorid species *Phaenicia sericata* (Meigen) and *Phaenicia pallescens* (Shannon) are compared. *P. pallescens* is not capable of overwintering in the Chicago region in an unheated shelter while *P. sericata* can overwinter as larvae.

The synanthropic blow flies *Phaenicia sericata* (Meigen) and *Phaenicia pallescens* (Shannon) are sibling species similar in appearance and general habits. Within North America they differ in geographic range with *P. pallescens* a southern species and *P. sericata* in nearly every part of the United States and southern Canada. A comparative study was undertaken to determine if both species have the same ability to overwinter in a northern temperate region.

Flies were trapped in early spring using a modified U.S.D.A. fly trap. *P. sericata* was collected in Bensenville, Illinois, a western suburb of Chicago, and *P. pallescens* in Bokeelia, Florida. Females of the two species were placed in separate cages and allowed to lay eggs on raw hamburger. The colonies were maintained in Chicago and were routinely kept at room temperature on sugar, skim milk solution, and water. Maggots were raised on liver, hamburger, or dead mice.

Two cages were set up outdoors in an open shelter in Bensenville, Illinois, during the middle of August. Populations of *P. sericata* and *P. pallescens* were derived from the laboratory populations. For two generations the colonies were maintained in the usual manner and allowed to reproduce on hamburger in gallon jars half-filled with sawdust. Maggots produced in early October were placed in culture jars in an unheated closed shelter.

The maggots were checked on December 20. The *P. sericata* maggots were constricted similar to the pupariation stage described by Fraenkel and Bhaskaran (1973). Some of them moved slightly when the jar was disturbed. About 5% of the maggots were dead and no pupae were seen. The *P. pallescens* were not constricted and moved actively when disturbed; about 10% of these larvae were dead.

January and February are typically the coldest months of the year in this area of Illinois with night temperatures in the unheated shelter occasionally going below 0°F. No pupae were observed during these months. On April 22

the jars were taken into the laboratory and examined. In the *P. pallescens* colony there were 100% dead maggots (ca. 800) while in the *P. sericata* culture there were 46 (5.5%) live maggots, 157 (18.7%) dead maggots, and 635 (75.8%) pupae. After 6 days, eclosion began with most of the flies emerging. By June 1, of the 46 live maggots, half of them had formed apparently normal pupae and half had died; none of those that pupated from this latter group emerged.

Calliphoridae may overwinter in temperate regions as larvae, pupae, or adults. The calliphorids most commonly found as overwintering adults include *Phormia regina* (Dondero and Shaw, 1971), *Protophormia terraenovae* (Cousin, 1932), *Pollenia rudis* (Hall, 1948), and *Calliphora* species (Green, 1951; Sukhova, 1950). Most authors agree that *P. sericata* usually overwinters in the larval or post-feeding larval stage as reported by Zumpt (1965) in South Africa, Green (1951) in England, Norris (1959) in Australia, and James (1947) and Hall (1948) in the United States. The overwintering stage or stages of *P. pallescens* are less well documented.

Both *P. pallescens* and *P. sericata* have been reported to overwinter as larvae at least as far north as Charleston, West Virginia (Mail and Schoof, 1954) and diapausing *P. sericata* larvae have also been reported at New Brunswick, New Jersey (Hagemann and Barber, 1948). The Florida strain of *P. pallescens*, however, cannot overwinter in an unheated shelter in northern Illinois. Larvae enter quiescence as described by Andrewartha (1971) rather than the cold-hardy dormancy of true diapause. In this condition *P. pallescens* survives the milder part of the winter but not the more severe cold of January and February. Hall (1948) reports the fly to be numerous and active near Miami, Florida, in March but it does not reach population peaks until July in Charleston, West Virginia (Mail and Schoof, 1954), and the middle of August in Lawrence, Kansas (Schoof and Savage, 1955). This could result from a high mortality among overwintering larvae in areas with severe winters and annual re-colonization by incoming migrants from the south. The primary screwworm, *Cochliomyia hominivorax* (Coquerel), another sub-tropical calliphorid, is known to have this pattern.

By contrast, *P. sericata* becomes numerous in late spring and early summer (Mail and Schoof, 1954; Schoof and Savage, 1955), has a facultative diapause (Norris, 1965), and, as indicated in this study, is able to overwinter as larvae in severe cold. Additional evidence that *P. sericata* overwinters in a pre-adult stage is based on the earliest spring adults (about mid-April in the Chicago area) which contain pupal fat balls in the hemolymph, unfrayed wings, and a complete set of bulbous setae on the antennal pedicel (Greenberg, 1970). Observations of numerous adults flying in the beginning of May in Lawrence, Kansas, and Cohoes, New York (Schoof and Savage, 1955) suggest that *P. sericata* is capable of overwintering in most of its range in the United States. Analysis of early specimens should indicate the overwintering capability of this species in the northernmost regions of its distribution.

Literature Cited

Andrewartha, H. G. 1971. Introduction to the study of animal populations. The Univ. of Chicago Press.

Cousin, G. 1932. Étude expérimentale de la diapause des insectes. Bull. Biol. Fr. Belg. Suppl. **15:** 1–341.

Dondero, L., and F. R. Shaw. 1971. The overwintering of some muscoidean Diptera in the Amherst area at Massachusetts. Proc. Entomol. Soc. Wash. **73:** 52–53.

Fraenkel, G., and G. Bhaskaran. 1973. Pupariation and pupation in cyclorrhaphous flies (Diptera): terminology and interpretation. Ann. Entomol. Soc. Am. **66:** 418–422.

Green, A. A. 1951. The control of blowflies infesting slaughter-houses. I. Field observations of the habits of blowflies. Ann. Appl. Biol. **38:** 475–494.

Greenberg, B. 1970. Species distribution of new structures on fly antennae. Nature **28:** 1338–1339.

Hagemann, L. E., and G. W. Barber. 1948. Overwintering habits of *Phaenicia sericata* (Mg.). J. Econ. Entomol. **41:** 510.

Hall, D. B. 1948. The blowflies of North America. Thomas Say Foundation.

James, M. T. 1947. The flies that cause myiasis in man. U.S.D.A. Misc. Publ. No. 631.

Mail, G. A., and H. F. Schoof. 1954. Overwintering habits of domestic flies at Charleston, West Virginia. Ann. Entomol. Soc. Am. **47:** 668–676.

Norris, K. R. 1959. The ecology of sheep blowflies in Australia. *In*: Biogeography and ecology in Australia. Monographiae Biologicae **8:** 514–544.

Norris, K. R. 1965. The bionomics of blowflies. Ann. Rev. Entomol. **10:** 47–68.

Schoof, H. F., and E. P. Savage. 1955. Comparative studies of urban fly populations in Arizona, Kansas, Michigan, New York, and West Virginia. Ann. Entomol. Soc. Am. **48:** 1–12.

Sukhova, M. N. 1950. Novye dannye po ekologii i èpidemiologiches komu znacheniru sinikh miasnykh mukh *Calliphora uralensis* Vill. and *Calliphora erythrocephala* Meig. (Diptera, Calliphoridae). Entomol. Obozrenie **31:** 90–94.

Zumpt, F. 1965. Myiasis in man and animals in the Old World. Butterworths, London.